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(54) An improved drum and tub unit of a washing machine

(57) A drum and tub apparatus or unit for a washing machine comprising a tub for containing water, a drum for containing laundry and which is rotatable within the said tub, motor apparatus operable to drive the drum and means for suspension of the apparatus or unit, characterised in that the motor apparatus (12) includes an electric motor (15, 16) for driving a drive shaft (13) via a reduction gear (17) with said shaft being coaxial with and connected directly to said drum (11) and with said motor having a housing or body (14) which is connected to the suspension means (20) and carries said tub (10).

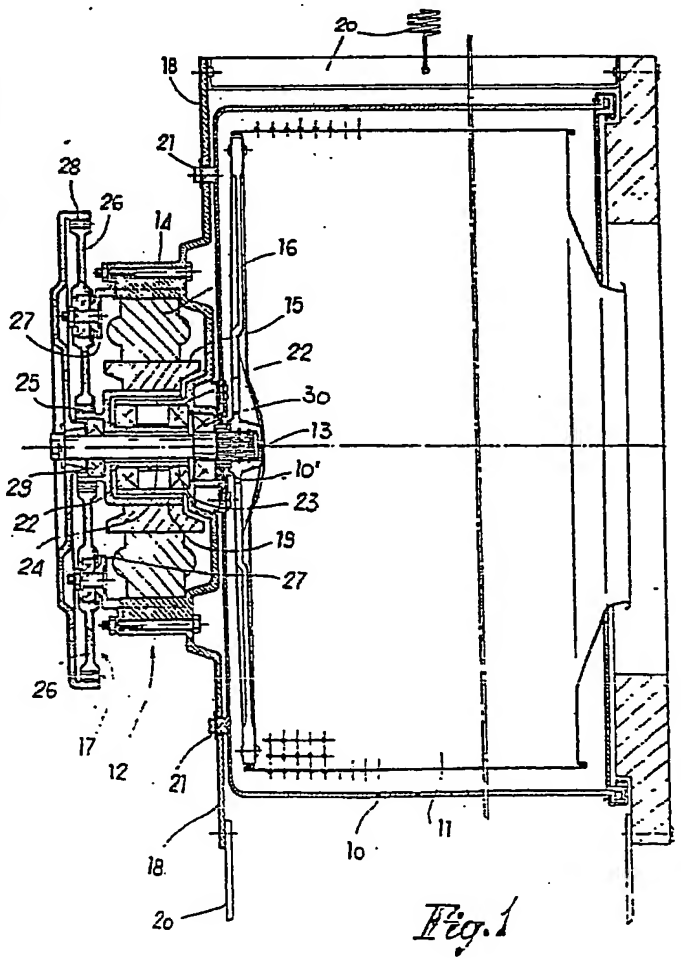

Fig. 1

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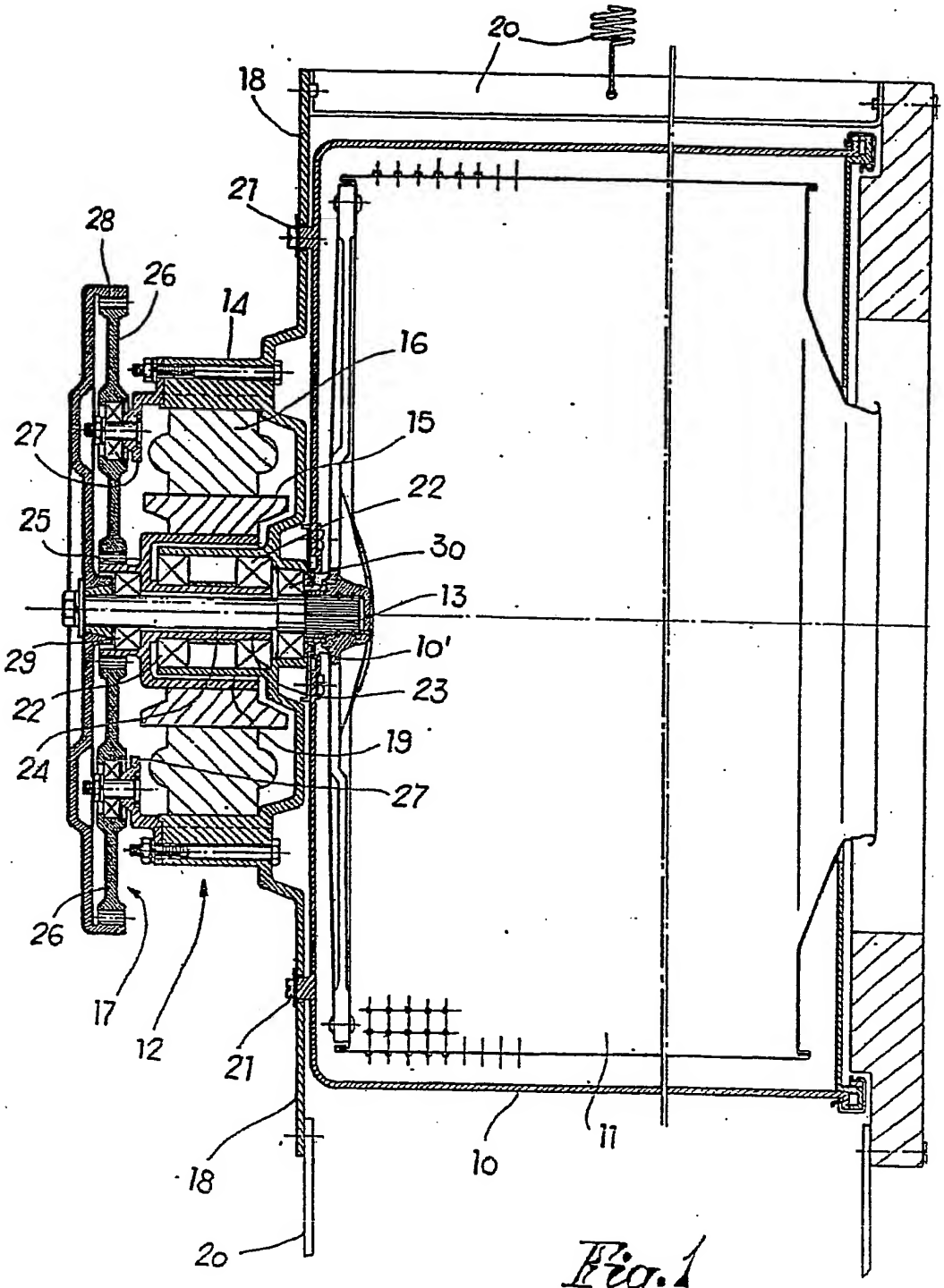
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Fig. 1

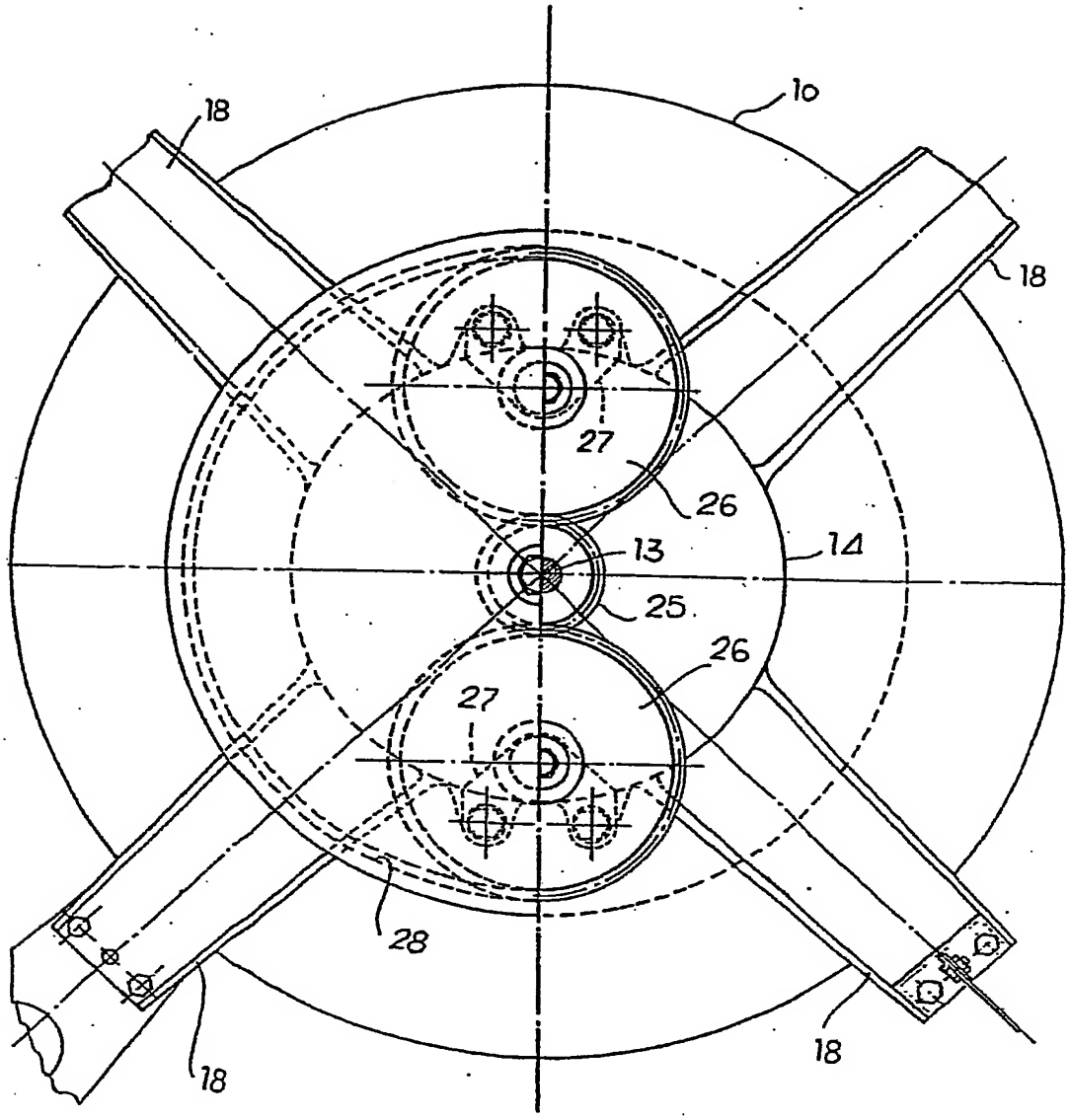

Fig. 2

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AN IMPROVED DRUM AND TUB UNIT OF A WASHING MACHINE

The present invention relates to an improved drum and tub unit of a front-loading washing machine comprising a tub, a rotatable drum and a drum drive motor.

Known front-loading washing machines generally comprise a tub for containing water, a rotatable drum located in the tub for containing laundry which is to be washed, rinsed and spun, and motor drive means to drive the drum.

In known embodiments the tub is supported by vibrating or oscillatable suspension means and the drum is fitted with a shaft which is supported through a sleeve and bearings in the back or base of the tub. The drive means includes an electric motor placed at a distance from the axis of the tub which rotatably drives the drum via a belt transmission including a pulley mounted on the motor shaft and another pulley on the drum shaft.

The tub thus directly supports the drum and is therefore subjected to high mechanical stesses which become particularly acute when the laundry is being spun.

The present invention relates to improvements in the drum and tub unit of washing machines which includes the tub, the drum and the drive means with the objects of: mounting the electric motor coaxially with the drum shaft; using the housing or body of the motor itself to support the tub and to connect to the means of suspension; thus freeing the tub from mechanical stresses with the advantage that even tubs made of plastics materials may advantageously be used; using the motor

shaft as a means for supporting the drum without the latter bearing upon the tub; and at the same time eliminating the traditional belt transmission with its corresponding pulleys and means for supporting the drum at the back or base of the tub so as to simplify the construction of the unit.

With such objects in mind, the improvements according to the invention provide for the use of an electric motor with a reduction gear having a drive shaft which is coaxial with and keyed to the drum of the washing machine and a motor body which is connected to the suspension means and supports the tub for receiving water. The motor-driven shaft is preferably supported within the housing or body, passes through the back of the tub and is keyed directly to the drum.

In practice this makes it possible to restrict the function of the tub solely to that of containing the water, unburdening it completely from the weight and the streses of the drum, while the motor supports the drum by means of its drive shaft and with its housing or body supports the tub and the entire unit on the means of suspension provided.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic cross-sectional illustration of the entire vibrating unit of a front-loading washing machine; and

Fig. 2 is a rear view of the machine of Fig. 1.

In the drawing a tub 10 of a front-loading washing machine is illustrated containing a rotatable drum 11 driven by drive means 12 located at the back or base of the tub 10 and having a drive shaft 13 which is coaxial with and keyed directly to the drum 11.

The drive means 12 comprises a housing or body 14, a rotor 15; a stator 16 and a reduction gear 17 which takes up the motion of the rotor and transmits to drive shaft 13 and thence to drum 11.

The body 14 of drive means 12 is located adjacent to the back or base 10' of tub 10 and has radial arms 18 on the outside and a cylindrical tubular portion 19 at the centre. Radial arms 18 extend to connect to the oscillatory means of suspension 20 provided in a way known in the context of the structure of washing machines. The back or base 10' of the tub 10 is secured at 21 to radial arms 18 and body 14 - see Fig. 1. Tub 10 is thus supported directly by the body 14 of drive means 12 and is connected only indirectly to the means of suspension through the radial arms 18 of body 14.

Rotor 15 of drive means 12 is rotatably supported by means of bearings 22 fitted on the cylindrical tubular portion 19 of body 14 while stator 16 is secured to said body 14 and through that to tub 10. Rotor 15 has a hub 23 which provides a through-axle passage 24 and a first gear 25 of reduction gear 17. This first gear 25 engages with at least two intermediate gears 26 rotatably mounted on corresponding supporting brackets 27 attached to body 14. In turn the two or more intermediate gears 26 engage a crown wheel with a gear on the inside 28 which is keyed to shaft 13 and which drives drum 11. The shaft 13 extends through passage 24 in hub 23 of rotor 15 and through a hole 10'' provided in the back or base 10' of tub 10 and is supported in the said hub and body 14 by bearings 29, 30.

Thus rotation of rotor 15 of drive means 12 causes shaft 13 and thus drum 11 to rotate through gears 25, 26 and 28 of reduction gear 17 without the drum bearing upon the tub which is in turn attached to the body of the drive means

without being stressed by the drum at any point.

The previously referred to objects and advantages are thus achieved by the proposals of the present invention with the further advantage that a simple compact structure is obtained which can conveniently be fitted into washing machines.

In its simplest aspect, the present invention relates to drive means for the drum of a washing machine comprising an electric drive motor having a housing or body having mounting means extending therefrom and connectable to suspension means for the tub of a washing machine and adapted to have said tub mounted thereon, and with said motor having a rotor connected via reduction gear means to a drive shaft for connection to said drum for rotation thereof within said tub.

CLAIMS

1. A drum and tub apparatus or unit for a washing machine comprising a tub for containing water, a drum for containing laundry and which is rotatable within the said tub, motor apparatus operable to drive the drum and means for suspension of the apparatus or unit, characterised in that the motor apparatus includes an electric motor for driving a drive shaft via a reduction gear with said shaft being coaxial with and connected directly to said drum, and with said motor having a housing or body which is connected to the suspension means and carries said tub.

2. A unit as claimed in claim 1, in which the housing or body of the motor apparatus has radial arms which are attached to the suspension menas and in which the tub is attached to said arms and said body through its rear or base.

3. A unit as claimed in claims 1 or 2, in which the drive shaft of the reduction gear is rotatably supported coaxially with the rotor and the body of the motor equipment and is keyed to the said drum passing freely through a passage in the centre of the back or base of the tub.

4. A unit as claimed in any of claims 1 to 3, in which the reduction gear of the motor apparatus is a reduction gear which includes a first gear keyed onto the rotor, one or more intermediate gears rotatably supported on supporting brackets attached to the body and a crown wheel with internal gearing keyed to the drive shaft, the intermediate gear or gears engaging said first gear and also engaging said crown wheel.

5. Apparatus substantially as herein described with reference to the accompanying drawings.

6. Drive means for the drum of a washing machine comprising an electric drive motor having a housing or body having mounting means extending therefrom and connectable to suspension means for the tub of a washing machine and adapted to have said tub mounted thereon and with said motor having a rotor connected, via reduction gear means to a drive shaft for connection to said drum for rotation thereof within said tub.

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